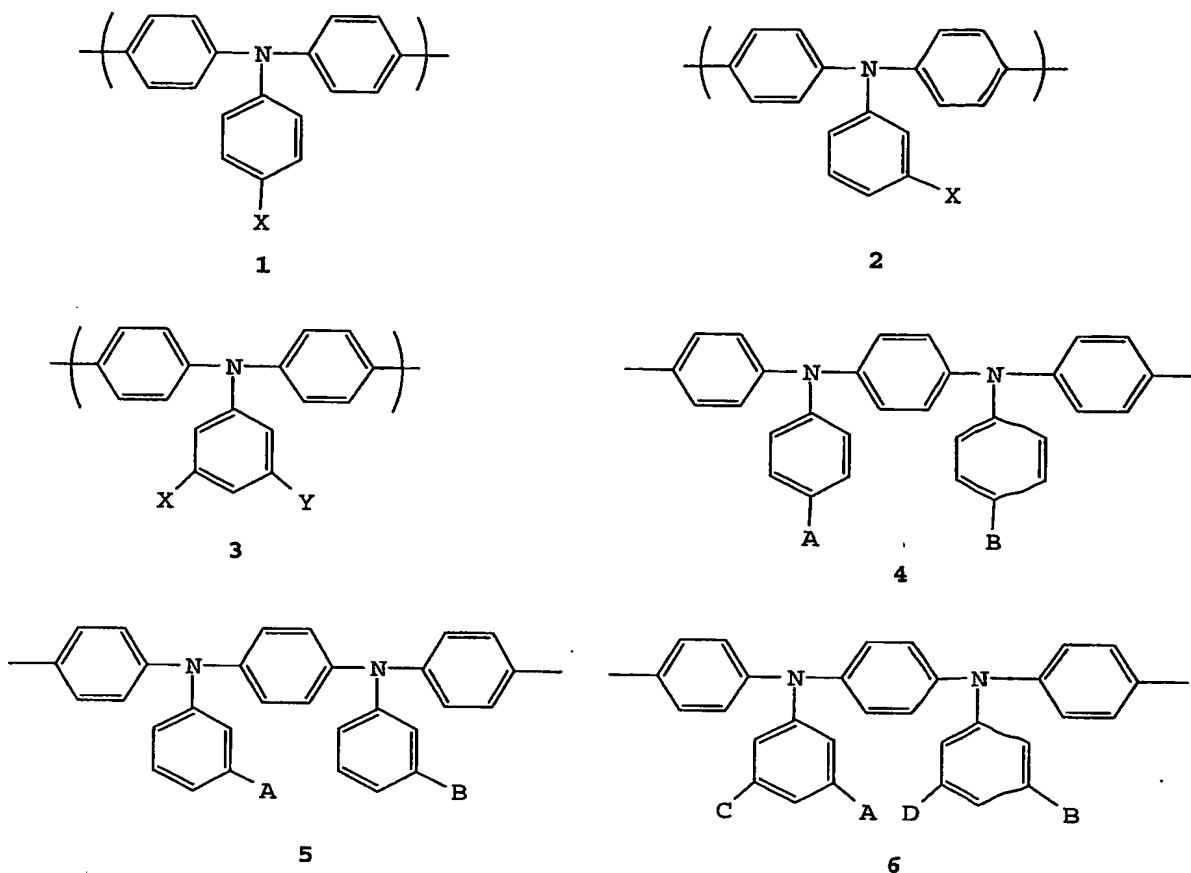


Claims

- 1) An optical device comprising
 - an anode
 - a cathode comprising barium, strontium or calcium; and
 - a layer of organic semiconducting material between the anode and the cathode

wherein a layer of hole transporting and electron blocking material is located between the anode and the layer of organic semiconducting material.
- 2) An optical device according to claim 1 that is an electroluminescent device.
- 3) An optical device according to claim 2 that is a full colour device wherein the layer of organic semiconducting material comprises red, green and blue electroluminescent materials.
- 4) An optical device according to any preceding claim wherein the cathode comprises barium.
- 5) An optical device according to any preceding claim wherein the layer of hole transporting and electron blocking material comprises a triarylamine.
- 6) An optical device according to claim 5 wherein the triarylamine is provided as repeat units of a polymer.
- 7) An optical device according to claim 6 wherein the polymer is a copolymer comprising one or more arylene co-repeat units.
- 8) An optical device according to claim 7 wherein one or more of the arylene co-repeat units are selected from optionally substituted fluorene, spirofluorene, indenofluorene and phenylene, preferably 9,9-disubstituted fluorene-2,7-diyl.
- 9) An optical device according to any one of claims 6-8 wherein the triarylamine repeat unit is selected from repeat units of formulae 1-6:

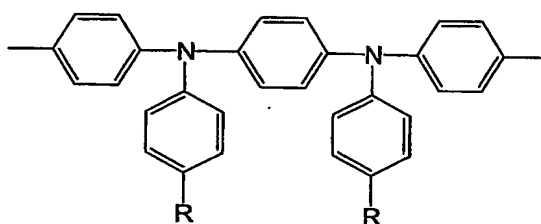


wherein X, Y, A, B, C and D are independently selected from H or a substituent group. More preferably, one or more of X, Y, A, B, C and D is independently selected from the group consisting of optionally substituted, branched or linear alkyl, aryl, perfluoroalkyl, thioalkyl, cyano, alkoxy, heteroaryl, alkylaryl and arylalkyl groups.

- 10) An optical device according to any preceding claim wherein the layer of organic semiconducting material is a semiconducting polymer, preferably a semiconducting copolymer.
- 11) An optical device comprising a semiconducting copolymer according to claim 10 wherein the semiconducting copolymer comprises repeat units selected from

optionally substituted fluorene, spirofluorene, indenofluorene and phenylene, preferably 9,9-disubstituted fluorene-2,7-diyl.

- 12) An optical device comprising a semiconducting copolymer according to claim 10 or 11 wherein said semiconducting copolymer comprises a repeat unit selected from triarylamine repeat units of formulae 1-6 defined in claim 9.
- 13) An optical device according to claim 12 wherein said co-repeat unit is a repeat unit of formula (I):



(I)

wherein each R is independently selected from the group consisting of H or optionally substituted, branched or linear alkyl, aryl, perfluoroalkyl, thioalkyl, cyano, alkoxy, heteroaryl, alkylaryl and arylalkyl group, more preferably C₁₋₁₀ alkyl, yet more preferably butyl.

- 14) An optical device according to any one of claims 12-14 wherein the molar ratio of the triarylamine repeat units is less than or equal to 50 %, more preferably less than or equal to 30 %, most preferably 1-10 %.
- 15) An optical device according to any preceding claim wherein a layer of hole injecting material is located between the anode and the layer of hole transporting and electron blocking material.
- 16) An optical device according to claim 15 wherein the layer of hole injecting material is poly(ethylene dioxythiophene).
- 17) An optical device according to any preceding claim wherein the cathode comprises elemental barium.
- 18) A method of forming an optical device comprising

- providing a substrate comprising an anode;
 - depositing a layer of hole transporting and electron blocking material onto the anode;
 - depositing a layer of organic semiconducting material over the layer of hole transporting and electron blocking material; and
 - depositing a cathode comprising barium, strontium or calcium over the layer of organic semiconducting material.
- 19) A method according to claim 18 wherein a layer of hole injecting material is deposited between the anode and the layer of hole transporting and electron blocking material.
- 20) A method according to claim 18 or 19 wherein the layer of hole transporting and electron blocking material and the layer of organic semiconducting material are both deposited from solution.
- 21) A method according to claim 20 wherein both the layer of hole transporting and electron blocking material and the layer of organic semiconducting material are polymers.
- 22) A method according to claim 20 or 21 wherein the hole transporting and electron blocking layer is subjected to heat treatment prior to deposition of the organic semiconducting material.
- 23) A method according to claim 22 wherein the heat treatment is below the glass transition temperature of the hole transporting and electron blocking material.
- 24) A method according to any one of claims 20-23 wherein the organic semiconducting material is substantially free of cross-linkable vinyl or ethynyl groups